CLAIMS

What is claimed is:

1. In an implantable cardiac stimulation device, a method comprising:

sensing ventricular channel signals using unipolar sensing;

sensing atrial channel signals using combined unipolar/bipolar sensing;

tracking refractory periods within both the atrial and ventricular channel signals; and

determining an atrial rate using combined unipolar/bipolar sensing logic applied to events sensed within the atrial and ventricular refractory periods as well as to events sensed outside the refractory periods such that a sufficiently reliable determination of the atrial rate is obtained to permit enabling Automatic Mode Switching (AMS) along with the combined unipolar/bipolar sensing.

2. The method of claim 1 wherein AMS can be selectively enabled or disabled within the device and wherein events sensed within the refractory periods are only used to assess the atrial rate while AMS is enabled, otherwise the atrial rate is assessed based only on events sensed outside the refractory periods.

3. The method of claim 2 wherein the device additionally is capable of performing an atrial high rate diagnostic evaluation and wherein determining the atrial rate using combined unipolar/bipolar sensing logic applied to events sensed within the refractory periods as well as to events sensed outside the refractory periods is also applied even if AMS is not enabled so long as the atrial high rate diagnostic evaluation is enabled.

4. The method of claim 1 wherein determining an atrial rate using combined unipolar/bipolar sensing logic applied to events sensed within the refractory periods as well as to events sensed outside the refractory periods comprises:

identifying events sensed only on the atrial channel as being true atrial events and counting the event for the purposes of atrial rate calculation;

identifying events sensed simultaneously on the atrial and ventricular channels as being a ventricular event and ignoring for the purposes of atrial rate calculation; and

identifying events sensed only on the ventricular channel as being noise and ignoring for the purposes of atrial rate calculation.

5. The method of claim 4 wherein, upon the identification of an event as being noise, a noise response function is activated.

6. The method of claim 1 further comprising comparing the atrial rate against a threshold and performing a mode switch if the rate crosses the threshold.

7. The method of claim 6 wherein the threshold is an atrial tachycardia detection threshold (ATDR).

8. The method of claim 1 wherein the step of tracking atrial and ventricular refractory periods comprises the steps of:

detecting an R-wave on the ventricular channel; and

initiating the atrial and ventricular refractory periods on the atrial and ventricular channels, respectively, following detection of the R-wave for a predetermined refractory period of time.

9. In an implantable cardiac stimulation device, a system comprising:

a ventricular sense amplifier operative to generate a ventricular channel signal from signals received from a ventricular lead using unipolar sensing;

an atrial sense amplifier operative to generate an atrial channel signal from signals received from the atrial and ventricular leads using combined unipolar/bipolar sensing;

a control unit operative to track refractory periods within both the atrial and ventricular channel signals; and

an atrial rate determination unit operative to assess the atrial rate using combined unipolar/bipolar sensing logic applied to events sensed within the refractory periods as well as to events sensed outside the refractory periods.

10. In an implantable cardiac stimulation device, a system comprising:

means for generating a ventricular channel signal from signals received from a ventricular lead using unipolar sensing;

means for generating an atrial channel signal from signals received from atrial and ventricular leads using combined unipolar/bipolar sensing;

means for tracking refractory periods within both the atrial and ventricular channel signals and for assessing an atrial rate using combined unipolar/bipolar sensing logic applied to events sensed within the refractory periods as well as to events sensed outside the refractory periods.

11. In an implantable cardiac stimulation device having a lead mounted in the atria and a lead mounted in the ventricles and capable of performing automatic mode switching (AMS), a method of determining an atrial rate comprising:

sensing an atrial channel signal between an atrial tip electrode and a ventricular tip electrode and sensing a ventricular channel signal between the ventricular tip electrode lead and a housing of the device;

tracking refractory periods on the atrial and ventricular channels; and

if AMS is enabled, assessing an atrial rate by applying combined unipolar/bipolar sensing logic to all events sensed on the atrial and ventricular channels, regardless of the refractory periods; and

if AMS is not enabled, assessing the atrial rate by applying combined unipolar/bipolar sensing logic only to events sensed on the atrial and ventricular channels outside to the refractory periods.